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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/712,326	11/12/2003	Rao Annapragada	LAM-P-1031	2008
48008	7590	04/25/2006	EXAMINER	
VIRTUAL LEGAL, P.C. MICHAEL A. KERR 3476 EXECUTIVE POINTE WAY, UNIT 16 CARSON CITY, NV 89706			NGUYEN, THANH T	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 04/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/712,326

Applicant(s)

ANNAPRAGADA ET AL.

Examiner

Thanh T. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 February 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date. _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 2/15/06 have been fully considered but they are not persuasive.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-19 are stand rejected under 35 U.S.C. 102(e) as being anticipated by Chooi et al. (U.S. Patent No. 6,465,888) in view of Lui et al. (U.S. Patent No. 6,647,994).

Referring to figures 2a-4f, Han et al. teaches a method of removing a photoresist layer (see col. 7, lines 59-60) from an integrated circuit (IC) structure having an etched dielectric layer with an exposed barrier layer, wherein the dielectric layer comprises silicon and oxygen (230, see col. 7, lines 47-54) and the barrier layer comprises silicon nitride or silicon carbide (215, see col. 7, lines 20-33), the method comprising:

Firstly, etching the dielectric layer (230) and exposing the barrier layer (215, see figure 2b);

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Secondly, feeding a first gas mixture into a reactor wherein the first gas mixture comprises carbon monoxide (CO)(see col. 8, lines 17-33);

Generating a plasma in the reactor (see col. 8, lines 17-33, noted that gas have to flow in the chamber and plasmanizing); and

Selectively removing the photoresist layer with little or no etching of the exposed barrier layer (see figure 2b, col. 8, lines 11-16), thereby minimizing the loss of the exposed barrier material during removing the photoresist layer. Noted that since removing the photoresist by ashing without removing anything inside of the opening would minimize the loss of the barrier material.

Regarding to claim 2, dielectric material is silicon dioxide (230, see col. 7, lines 47-54).

Regarding to claim 3, the first gas mixture further comprises oxygen (O₂) (see col. 8, lines 17-33).

Regarding to claim 4, the first gas mixture further comprises nitrogen (N₂) (see col. 8, lines 17-33).

Regarding to claims 5, 11, 15, the first gas mixture further comprise the gas mixture selected from the group consisting of oxygen, nitrogen, nitrogen/oxygen, nitrous oxide, ammonia, nitrogen/hydrogen, and water vapor (see col. 8, lines 17-33).

Regarding to claims 6, 12, 17, etched dielectric material is composed of a material selected from the group consisting of silicon dioxide, silicon oxide, organosilicate glass, and fluorinate silicate glass (see col. 7, lines 34-54).

Regarding to claims 7, 13, 18, cap layer located between the dielectric and the photoresist, the cap layer is composed of a material selected from the group consisting of silicon

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dioxide, silicon oxynitride, silicon carbide and silicon nitride (235, silicon nitride, see col. 7, lines 54-58).

Regarding to claims 8, 14, reactor used to remove the photoresist from the IC structure is also used to etch the dielectric (see col. 8, lines 1-16).

Regarding to claim 9, a third layer that includes a conductive interconnect (210) that abuts the barrier layer (215) and the second dielectric material (220) adjacent the conductive interconnect, the barrier (215) between the etched first dielectric layer (230) and the third layer (210).

Regarding to claims 10, 16, 19, the first dielectric layer (230) and the second dielectric layer (220) is comprised of materials that include silicon and oxygen (see col. 7, lines 34-54, noted that silicon oxide includes silicon and oxygen).

Chooi et al. teaches etching the photoresist film by using carbon monoxide gas (CO) (see col. 8, lines 17-33). However, the reference does not teach removing the photoresist film from the surface of the structure by using carbon monoxide gas.

Lui et al. teaches removing the photoresist film by using carbon monoxide gas (CO) from the surface of the structure (see figures 1b-1c, col. 3, lines 65-67, col. 4, lines 1-14). Noted that the same gas would inherently provide the same function as minimizing the loss of the exposed barrier during the removal of the photoresist film.

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would removing the photoresist film by using carbon monoxide gas (CO) from the surface of the structure in process of Chooi et al. as taught by Lui et

al. because removing the photoresist film by using carbon monoxide gas would prevent attack or damage to the bottom layer or the side wall of the structure.

Response to Arguments

Applicant's arguments filed 2/15/06 have been fully considered but they are not persuasive.

Applicant contends the first gas mixture being an oxidizing gas mixture (on page 12, lines 11-16). In response to applicant that the present specification page 12 teaches one embodiment the oxidizing gas mixture comprises oxygen and carbon monoxide, in another embodiment, the gas mixture comprises carbon monoxide and nitrogen, another embodiment the mixture comprises carbon monoxide in combination of nitrogen and oxygen, carbon monoxide and ammonia...etc. (see pages 12-11). Noted that applicant cannot exclude the gas from the specification. Applicant contends that NH_3 is a reducing/non-oxidizing gas mixture. Examiner agreed that NH_3 is a reducing/non-oxidizing gas mixture, so the nitrogen/hydrogen gas.

Applicant contends Chooi fails to teach removing the photoresist layer by "oxygen plasma ashing". In response to applicant Chooi clearly teaches patterning the photoresist by using carbon monoxide mixtures (see col. 8, lines 16-33). While Liu teaches removing the photoresist film by using carbon monoxide gas mixture (see col. 3, lines 55-61).

Applicant contends Liu teaches removing a photoresist layer with reducing or non-oxidizing gas mixture, which comprises carbon monoxide, NH_3 and no oxygen. In response to applicant, Liu clearly teaches removing a photoresist layer with oxidizing gas mixture

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comprising carbon monoxide (see col. 3, lines 55-61, noted that the oxidizing gas is carbon monoxide).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (571) 272-1702. The fax phone number for this Group is (703) 872-9306.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (See **MPEP 203.08**).

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pairdirect.uspto.gov>. Should you have questions on access to thy Private PAIR system, contact the Electronic Business center (EBC) at 866-217-9197 (toll-free).



Thanh Nguyen
Patent Examiner
Patent Examining Group 2800

TTN